EXHIBIT 5

UNCERTIFIED ROUGH DRAFT TRANSCRIPT ONLY

UNCERTIFIED TRANSCRIPT DISCLAIMER IN THE MATTER OF SIGNIFY NORTH AMERICA CORPORATION and SIGNIFY HOLDING B.V. vs. LEPRO INNOVATION, INC., et al.

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MADAM COURT REPORTER: Before we get started, I just wanted to request that if any parties don't anticipate on speaking, please mute yourself, as it may be difficult to hear certain responses with background noise.

My name is Michelle Ferreyra, Certified Court Reporter for the State of Nevada, #876. Today's date is August 25, 2023. The time is approximately 10:0r a.m.

This is the deposition of Dr. Regan Zane.

At this time, I will ask counsel to identify themselves and whom they represent, your location, and agree on the record there is no objection to this deposition officer administering a binding oath to the witness via ZOOM, and then I will administer the oath.

MR. CHEN: I'll go first.

This is Mr. Hue Chen, counsel for the defendant in this case. They are collectively known as LE Pro Defendants. I'm sorry. It's a long name. I'm going to go through all of this.

And we do agree to this deposition being taken via Zoom remotely, and we are currently based in LA, Los Angeles, taking the depo.

MR. OCZEK: This is Jeremy Oczek --

MR. CHEN: Sorry, Jeremy, let me finish, just for the record.

For the record, in the same room with me: Our associate, you know, Shirti, as well as Attorney Nick Brown from -- co-counsel from Greenberg Traurig.

Okay. Jeremy, go ahead.

MR. OCZEK: This is Jerry Oczek from Bond, Schoeneck & King representing Plaintiffs Signify North America Corporation and Signify Holding B.V., as well as the witness, Dr. Regan Zane.

With me is counsel of record in the case, Jonathan Gray, from my firm Bond, Schoeneck & King, as well Chris Austin from the Weide & Miller firm located in Las Vegas, Nevada.

I am in Buffalo, New York. Jonathan is in Syracuse, New York. And we consent to the Zoom deposition and proceeding today.

MADAM COURT REPORTER: Could you announce your clients as well, sir?

MR. OCZEK: Sure.

Also listening in today from the client, Signify, is Michael VanHandel and Gary Yen.

MADAM COURT REPORTER: Thank you.

(Court reporter duly administers oath to witness.)

THE WITNESS: Yes, I do.

MADAM COURT REPORTER: Thank you.

Whereupon,

DR. ZANE REGAN,

having been first duly sworn to testify to the truth, the whole truth and nothing but the truth, was examined and testified as follows:

EXAMINATION

BY MR. CHEN:

Q. So, Dr. Zane, good morning.

Could you please state your full name, just for the record.

A. Yes. My full name Regan Andrew Zane.

Q. Have you been deposed before?

A. Yes, I have.

Q. Do you recall roughly how many times have you been deposed before?

A. I don't but more than 20.

Q. Thank you, Doctor.

So, Dr. Zane, I have uploaded into the chat room for the Zoom meeting, which I previously marked as Zane Declaration Exhibit 1.

Were you able to download it and review it in your computer?

A. Yes, I have. I have a file named Zane Declaration Exhibit 1. On the first page it shows Exhibit 16. I'm just glancing through it briefly?

With my signature at the end, this is my declaration.

And for your reference, I do have clean printed copies on my desk in front of me of my declaration and my -- and the patent itself.

Q. Oh, that's wonderful. Thank you so much for the prep work.

So if I can bother to -- either the physical copy or soft copy you have -- to Page 14 of your declaration, which again is Zane Dec. Exhibit No. 1 that we have marked.

Is that your signature in the middle of the page?

A. Yes, I believe that is my signature.

Q. Okay.

And this says: Executed, this declaration, on the 4th day of August 2023.

That's correct; right?

A. That is correct.

Q. So when you signed the declaration on August 4, 2023, you believe the statements in your declaration were true and correct; is that correct?

A. That is correct. And when the time is appropriate, in my review, there is one aspect of -- of my declaration that I -- I would like to correct. But it's not in the declaration itself. It's in the list of materials considered.

Q. Okay. Understood.

So is there anything in the declaration itself, the declaration that you signed, that you would like to either amend or correct as of right now?

I mean, I understand based on your answer just now, you do not, but please confirm for the record.

A. That is confirmed, not at this time.

Q. Thank you, sir.

Now, I am going to upload another document which we have previously marked as Zane Dec. Exhibit No. 2.

So please confirm that now, once you've received in the chat room.

Just for the record, your counsel -- well, counsel for Signa Sic - Signify? has represented to us that this is Exhibit A to your declaration.

Please go ahead and take your time, download it, and review it on the computer.

MR. OCZEK: Well, we also subsequently filed

this -- these two exhibits with the Court, so it's also in the docket.

MR. CHEN: Yeah. I think the version we have is not a version of the docket-stamped copy, but I will represent to Dr. Zane this is a true and correct copy that we received from, you know, counsel for Signify about a week ago.

BY MR. CHEN:

Q. Dr. Zane, feel free to, you know, take your time to review it to see if it's a true and correct copy of, you know -- I believe this was your CV.

A. I have received this in the chat. I've downloaded it. I've gone through, briefly, files listed as Exhibit 2 on the front page it says Exhibit A.

This does appear to be a version of my CV that I had submitted. It is my understanding that this is a true and correct copy of my CV.

Q. Thank you for that confirmation, Doctor.

Next up, I am going to upload to the Zoom chat room which has been previously marked as Zane Declaration Exhibit 3, which, again, I'll represent to you is a copy of the Exhibit C to your declaration that counsel for Signify emailed us or presented to us in the last week.

Please confirm that you can download it to your computer, have the time to review it, and at least confirm this is a version of Exhibit -- of the Exhibit C to the Zane dec. that was previously prepared.

A. I have downloaded this file name, which was Exhibit 3. On the front page, it says Exhibit C.

This appears to be the list of materials that I had submitted. As I mentioned previously, when the time is appropriate I do have one edit that I would like to make to this list.

Q. Okay.

I think the time is right now, so what do you intend to add to the list of material you have considered?

A. The one item that I found missing from this list that I submitted is the file history for the '577 Patent.

Q. So I just want to make sure I understand this.

So is your testimony today that it was -- when you were preparing this Exhibit C in connection with preparing a declaration, you reviewed the file's history of the '577 Patent, but you did not.

THE WITNESS: Sorry, ma'am.

BY MR. CHEN:

Q. So maybe an oversight include the Exhibit C.

A. But, to clarify, components of the file history had been discussed. I had questions related to the file history. I had aspects of file history shared with me that were a part of my early discussions that led to its development of my declaration.

Those were all aspects that were considered as I developed my declaration, as well as this list of materials considered. So I think it would have been more appropriate that I had listed file history here as list of materials considered.

Since the time that I submitted my declaration, I have also taken time to carefully -- more carefully review the file history in addition to the components of the file history that I had considered prior to submitting my declaration.

Q. Thank you for that clarification, Doctor.

So if I can direct your attention just to this list, I think the list has -- based on what you clarified today with our three bullet points. The first bullet point, the patent cells , U.S. Patent No. 8,063,577.

Based on what you just testimonied today, you

also reviewed the file history for '577, at least portions of that prior to your submission of the declaration.

I think the last bullet point on this would be the party's respective claim construction positions, quote/unquote. ch

Do you wish to amend or correct this list of material considered today?

A. Well, in our discussion, I certainly leave -- leave the opportunity open as I -- as we have our discussion and as I may recall additional items. But at this time, I don't.

Maybe just to clarify, though, with respect to, you know, the patent itself, the '577, the mentioning here of the parties' respective claim construction positions -- you know, just to clarify, the information that I have from the parties' respective claim construction positions included excerpts from the parties' -- and forgive me if I don't have the terminology right here, but the party's joint claim construction response or submission or document that was -- that was submitted. That included quotes from each of the parties on their claim construction positions, in addition to additional references that each party had referred to, including, for example,

dictionary references and other standards references related to these claim terms.

And so I had reviewed those -- those items that were associated with each of those references. But I've included them all here as a list stating that the parties' respective claim construction positions.

So just to clarify, I was considering those aspects as well as those references as part of that statement.

Q. Oh, again, thanks a lot for that clarification.

Other than I believe what you mentioned -- clarified what, you know, their -- I mean, what we call a joint claim construction chart and the extrinsic evidence the parties submitted to the court, including the dictionaries, do you have any additional material you have reviewed in preparation of the declaration?

A. At this time, I don't recall.

Q. Okay.

A. At this time, I don't recall additional materials.

Certainly, I relied on my background and my recollection of a variety of experiences and materials, in my experience as a professional in this area.

But, again, reserve the right to update this,

of course, if we become aware of something I realized that I should have included.

Q. Oh, thanks again.

Now, I previously uploaded in the chat room what we had previously marked as Zane declaration Exhibit 4, which is a copy of the patent here, the '577 Patent.

If you don't mind, we'll -- I'll just reference to this patent, which is -- you know, the full number is 8,063,577, but I will refer to it as a '577 Patent throughout today's deposition.

Is that okay with you?

A. Yes, that is okay.

Q. All right.

So I think you mentioned you have a file copy of the patent. I also uploaded a soft copy of the '577 Patent, of which I know which you have downloaded.

I just want to make sure you do recognize what I had previously marked as Zane Exhibit No. 4 and confirm it is a copy of the '577 Patent.

A. Yes, I confirm.

MR. OCZEK: Excuse me.

It looks like you put it in the chat twice. Is it the same document?

MR. CHEN: It could be the case, because I

think it was -- maybe it was some technical glitch, but it's -- it is what -- the file that -- the name of the file is Zane Deck Exhibit 4, '577 Patent.

MR. OCZEK: Okay. Thank you.

MR. CHEN: You're welcome.

BY MR. CHEN:

Q. Dr. Zane, if I may direct your attention to 51 of this '577 Patent, if you can turn to that, I guess, second page.

Please let me know once you're on that page and you're looking at Figures -- Figure 1.

A. I am on that page.

Q. Okay.

So if you're looking at Figure 1 on the top of the figure, there is a black, sort of, rectangular box which is marked as element Ls, capital L, small S.

Do you see that?

A. Yes, I do.

Q. Okay.

Is it -- do you recall reading the specification of the patent where the patent has described Ls as something called a "stray inductance"?

A. Yes, I do.

Q. I will draw your attention to Column 3, Line 22, 23-ish in the patent.

Are you there? If I can direct your attention to that portion of the patent.

A. Yes, I am there. And yes, I am familiar with this.

Q. Okay.

Would you please explain to me what's the meaning of the term "stray inductance"?

MR. OCZEK: Objection. Form.

THE WITNESS: In the context that is being described here by the patent inventor, what is being described is a transformer. And within the transformer, we have, in this case, two or three windings on a transformer. And what we mean by that is that there's a physical structure.

And let's focus on, let's say, a first winding, which, for example, in Figure 1 would be indicated on the left-hand side of this figure. And if we have a first winding, it's -- it's, for example, a coil that's wrapped in some way as part of this magnetic structure, this transformer. It would be recognized and understood that in such a structure, in this case, the transformer, that the behavior, the electrical circuit behavior, of that transformer can be modeled using equivalent circuit elements.

And in the case of Figure 1, what we see here

on what we call the primary side, which is the left-hand side where Ls resides, what we see here is the equivalent circuit model for some of the important aspects of the behavior of that primary winding of the transformer.

You asked specifically about Ls, and it was being described as a stray inductance. It can be an inductance that is associated with that structure that is placed in the configuration shown in Figure 1. This would be the portion of inductance, for example, that does not couple in the way that we describe it to the secondary site the circuit. It is stray to the primary side of that circuit.

The component Ls, then, would also be, you know, associated with the additional behavioral aspects of that winding, such as Ls of M, which would be a main or often termed the "magnetizing inductance" of that transformer.

BY MR. CHEN:

Q. I think you mentioned -- and correct me if I'm wrong -- Ls is associated with a structure that's been pictured in 8a of Figure 1, which is a primary winding of the -- of the transformer; right?

Do I understand your testimony correctly?

A. Just to be clear, the inventor, as is

mentioned a bit later in that same paragraph, is using an equivalent circuit model to describe the physical structure of the transformer which is shown in Figure 1 and Figure 2.

The inventor, in drawing this diagram, has used a very -- very traditional, very well-known equivalent circuit model to describe the circuit behavior as shown in Figure 1.

The circuit diagram as it's shown in Figure 1 indicates the functional, you know, behavior of that circuit through what we just described as the equivalent circuit model.

The component Ls, the component Lm, and then as drawn 8a, in this equivalent circuit diagram -- these are all equivalent circuit elements to describe the physical structure of the transformer.

The transformer is labeled as 8, 8a, 8b1 and 8b2. But as they're drawn in Figure 1, these components, 8a, 8b1, and 8b2, are drawn in a way a skilled person would recognize as being part of the equivalent circuit model, meaning the way they're drawn, they are representing the idealized behavior of that transformer and its windings, because the additional behavioral aspects of that physical structure, the transformer, are shown separately as Ls

of M and Ls of S.

The drying itself doesn't clearly identify the physical structure or the primary winding itself of the physical structure. But in the patent, the inventor has used the terminology 8a seeming to indicate both the winding of the primary winding of the physical transformer as well as what is physically drawn here as the component, the idealized component, in the equivalent circuit model.

Q. Okay. So let me make sure I unpack that.

First of all, I think what I hear you saying is the 8a, 8b1, and 8b2 as depicted in Figure 1 of the 77 patent is not the -- it's -- it's a math -- it's a model of the physical object, the physical transformer; it's not the transformer itself?

MR. OCZEK: Objection to form.

BY MR. CHEN:

Q. Did I understand that correctly?

A. I believe your understanding is correct.

This is the way I would understand, is the drawings for both Figure 1 and Figure 2 are clearly indicating the components of an equivalent circuit model of that transformer, and that would include the depiction of 8a.

Q. And also -- I also want to understand: You

meant -- is it your testimony that this Ls, as depicted in Figure 1, is a model to reflect a characteristic of the primary winding, 8a, of the transformer, the physical object?

Is that -- is that correct?

MR. OCZEK: Objection. Form.

THE WITNESS: Generally speaking, I believe what you've stated is correct.

And just to clarify, you know, as we look at the Column 3 in that similar area, same -- same sentence, essentially, that you pointed me to previously, around Line 24 or 23, where it first introduces a stray inductance Ls of S and a main inductance Ls of M of primary winding 8a.

I know I'm separating myself from that quote, but going back to the figures, we see it in Figure 1. We see the Ls, we see Lm, and it's being described as part of the primary winding.

These are components being described -- and as I mentioned, this is an equivalent circuit model of that actual transformer. And the inventor did clarify this in the next sentence, and I'm going to quote from that to quote (as read):

"These inductances, Ls and Lm are not actual elements but are shown, since these inductances, Ls and

Lm, may be selected in combination with the capacitance of the resonant capacitor such that zero voltage switching is obtained."

The reason I note that is just to clarify the inventor is stating these are important elements. As described, there's certainly an indication that Ls and Ls of M and 8a are part of the physical structure that is being described as the transformer and, in this case, the primary winding of the transformer.

Very -- it is certainly possible that aspects of Ls of S and even Ls of M could be external components, but there's no indication that it was specifically described that way. The indication and the way it was described here by the inventor, at least as depicted in Figure 1, is that these are equivalent elements of the physical transformer.

BY MR. CHEN:

Q. Now let's talk about this physical transformer for a second.

You have primary winding, which is depicted in photo -- it's in Figure 1 as 8a as a model. And you have secondary winding, which is depicted in Figure 1 of the '577 Patent as 8b1 and 8b2.

So physically, are we talking about two coils?

MR. OCZEK: Objection. Form.

THE WITNESS: The description of the -- you know, what you're describing is a very reasonable description of the transformer, is the physical structure itself, meaning there's a clear indication here that the transformer would have at least two windings, if not three windings.

The primary winding would be on the primary -- what we call the primary side of that transformer. And then the secondary winding would be split in two, to create the windings on the secondary side.

What is depicted in Figure 1 is the equivalent circuit model of the behavior of such a structure, where each of these elements have a relation to that physical structure. For example, you know, the number of turns of that wire on that structure or the physical location of those -- of those windings on the structure to each other.

Those are the details that determine Ls of S, Ls of M, and the idolized behavior of 8a, 8b1, and 8b2.

BY MR. CHEN:

Q. Yeah, I'm trying to understand physically what that primary winding would look like.

We're talking about, like, some sort of coil;

right?

A. If we were to show a picture of an element that would be used in -- as is being described here, it would be a physical structure and, for example, it might have a ferrite or a ferromagnetic component to it. It might have a -- what we call a bobbin, you know, an element that makes it easier to wrap wire around it and to attach it to that magnetic ferrite or structure.

And yes. So typically, then, you would be talking about a physical wire that would be wrapped, for example, around that bobbin for a primary side and something similar for the secondary side, perhaps on the same bobbin or -- or on another one but contained in that physical structure.

Q. So the two coils are separate. Or if it's three coils, they're separate. I just want to make sure I understand that.

We're not talking about one coil, portions of which is 8a, portions of which is 8b, could be 8b1 or 8b2?

MR. OCZEK: Objection. Form.

THE WITNESS: It would be expected and understood in implementing a transformer to realize the equivalent circuit behavior shown in Figure 1; that

there would be an independent winding on the primary and then a separate independent winding or two windings, depending on how they are split, on the secondary side of the circuit.

Combined, they would create the behavior of the equivalent circuit that's drawn in Figure 1.

BY MR. CHEN:

Q. Thank you, Doctor.

So this inductance, is there any way to measure how big that inductance is or how low it is for Ls and Lm, just so that I'm clear about it? Or maybe generate any, Doctor?

Is there any way to measure them?

MR. OCZEK: Objection. Form.

BY MR. CHEN:

Q. I take that back, that question.

Let me ask you, sir: How would you measure the value of the inductance of the inductor?

MADAM COURT REPORTER: Did you say "the value of the inductance"?

MR. OCZEK: Yes.

MR. CHEN: The value -- the inductance value of an inductor.

MADAM COURT REPORTER: Thank you.

THE WITNESS: So generally speaking, if I

understand the question right, when there is a component, lack of inductor, you know, if it were an independent separate structures in the inductor or as a transformer, where there are inductive aspects or elements associated with that transformer.

When we are looking to measure the inductance of any such structure and -- we first look at the -- the model that we're developing of that structure. If it's a simple inductor, we presume that it will be modeled as an inductor, perhaps with resistance and capacitance that would be associated with that inductor.

And then to measure this, we take the inductor, and we apply it to a measurement, you know, test circuit. Essentially, we would inject signals into that circuit, you know, the test sample, in this case, the inductor. And we would measure voltages and currents. And then depending on the type of model that we're deriving, we would then deduce from those measured voltages and currents an approximation for the model of that element.

In this case, for example, we could measure from the voltage and current response what the equivalent inductance is of that structure and any parasitics, such as resistance or capacitance that

would impact or measure to that inductance.

Q. Have you heard the term "inductance meter"?

A. The type of test structure that I was just describing could be considered an -- an inductance meter, or we might have, you know, an impedance measurement equipment that has the ability to measure inductance, measure capacitance, measure resistance. That would happen in an inductance meter or inductance measurement capability filter.

Q. So is there any way to measure the Ls, inductant value of Ls?

A. The inductance value of Ls -- you know, the short answer is: Yes, we do this, and we -- we find ways to -- to measure an approximation for this inductance Ls of S.

But we need to recognize that, you know, this physical structure has a complex, what we call "impedance behavior." And what we're looking at in FIG. 1 is -- is a simplified equivalence circuit of that full structure. This equivalent circuit doesn't account for all physical phenomena of that structure.

So what we're measuring is an approximation. We're saying this is the model that we're going to fit measured voltage and current behavior to, and this is going to give us close to a good functional

representation of how that structure operates.

So, for example, for Ls, the concept here is that, as I mentioned before, there's a portion of inductance associated, for example, with a primary winding that does not couple -- or at least doesn't couple well to the secondary site of the circuit, meaning there isn't a strong relationship between the magnetic fields or the current and voltage associated with that inductance to the secondary sign. This is why we -- we define it and show it in the circuit diagram the way that we do.

In this case, you can measure that inductance Ls of S, for example, by attempting to negate the effect of the rest of the magnetic structure. One way to do that, for example, would be to short-circuit, meaning, you know, physically or directly attaching a wire across the secondary windings or second winding in an attempt to negate the effect of Ls of M as well as any other reflectant impedence from the transformer or the secondary. In which case, that reduces is this magnetic structure down to what looks a lot like just an inductor Ls of S.

Then we put it on an inductance meter, and we can measure it that way. It's not exact, but that would be an approximate way to measure that inductance.

Q. Thank you.
So do I understand that to, again do an approximate measurement of the value of Ls, what you do is you short-circuit, which is depicted here on FIG. 1, 10a and 10c, and then you put your inductor meter -- the probe of the inductor meter at the two end of that primary winding or that coil, that physical object, and you read the measurement out of it.
A. You understand what I said correctly.
Q. Well, maybe what -- you know, I can shortchange it.
Do I also understand that if you were to measure Lm of the primary winding, what you do is you draw an open circuit? In other words, you cut off 8a and the b from the rest of the circuit, and you put your probe of your inductor meter at the two ends of the primary. That gets you an approximation of Lm, the value of Lm.
A. I believe that's not quite correct. If we -- if we measure it in the way that you just described, you know, that would include most likely the effects of Ls of S and Ls of M, and that wouldn't give you the main or magnetizing inductance directly.
Now, alternatively, if there were -- because, unfortunately, we don't have an independent way of

measuring Ls of S in that scenario. But alternatively, if we leave the entire primary circuit open so that there's zero current in the equivalent concept of Ls of S, then measuring Ls of M -- and keep in mind, Ls of M is not just a function -- you know, behavior of the primary winding. This is a main inductance. This is intended to model the coupled, you know, behavior of the transformer, meaning coupling between the primary and the secondary. And so we could then measure the behavior from the secondary side.

Now, the way that the circuit has been drawn is somewhat simplified, again, because it's not showing the additional equivalent of Ls on the secondary side. But presuming, as was described by the inventor, that Ls of S has been specifically designed to be present in the circuit for a reason, meaning it's slightly likely? larger than -- than would be perhaps on the secondary side. Then this measurement might be accurate. In which case, we would have what you suggested as the open circuit. But the open circuit would be on the primary, and then we would measure the main inductance from the secondary, which can be measured, really, from any terminal, any pair of windings.

Physically where it's located in the circuit

diagram is really up to the circuit, you know, designer in describing the behavior, but Ls of M could be placed on any of the secondary side. It's just a matter of reflecting that impedance through the transformer.

So if we measured on the secondary, we could then reflect that impedence or inductance back to the primary side, and that would be a measure of Ls of M.

Q. So I think what I hear you saying is we can measure Lm by just keeping an open circuit and put your probe to the true end of the primary winding of 8a and open circuit, meaning the left portion of FIG. 1, is open; right?

MR. OCZEK: Objection. Form.

THE WITNESS: Let me clarify, because I might have misheard you. But, yeah, in the final version that I was describing, the primary physical winding would be open. I believe we said that correctly. But the measurement would be done on the secondary side in that case because the primary side is open. We don't connect anything to the primary side. We only inject voltage in current in that case on the secondary side, and that could be a way of estimating the inductance Ls of M. Of course, as we mentioned, is our approximation with the other parasitic elements that are not depicted in this model.

BY MR. CHEN:

Q. So let me -- I just uploaded --

A. And --

Q. Go ahead.

A. Just to clarify, I just want to be sure that it's clear.

In my description before, you're saying that we can apply the injection on the secondary side.

Physically in that model, as you're seeing here, what that means is the current and voltage are being applied, for example, at 10a and 10c and 10b, and that is forcing current through to 8a in this idealized model, which then is applying current and voltage to Ls of M, which is what's allowing us to measure that inductance from the secondary side. But -- just to clarify what I meant there.

Q. Okay. Thank you.

So I have uploaded into the chat room what we previously marked as Zane Deck Exhibit C.

Could you please confirm you received it, can download it.

MR. OCZEK: That is No. 6, HOA.sp'g -- Hue?

MR. CHEN: Yeah, No. 6.

MR. OCZEK: Okay. You skipped over 5?

MR. CHEN: Yes. We'll go back to Exhibit 5 at some point.

MR. OCZEK: Okay. I just wanted to keep track of numbering. That's all.

MR. CHEN: Thank you.

THE WITNESS: Yes, I have downloaded Exhibit 6.

BY MR. CHEN:

Q. So, Doctor, you are a IEEE Net member; right?

A. That's correct.

MADAM COURT REPORTER: I'm sorry. I didn't hear you.

MR. CHEN: I triple E, it's IEEE.

MADAM COURT REPORTER: Thank you.

BY MR. CHEN:

Q. So what is IEEE, Dr. Zane?

A. The IEEE is a -- is a societal organization of electrical and electronic engineers. It's an international society that is one of the largest, if not largest, professional societies of -- in engineering, in this case specifically, in electrical and electronic engineers, organizes conferences, develops standards as well as provides publications.

Q. So if you were to look at the Zane pack, Exhibit C, which, again, you have a copy, is that one

of IEEE-type publications?
A. Yes, this is.
Q. So -- and the title of this dictionary is called, just for the record, the authoritative dictionaries -- dictionary of IEEE standards from -- do you see that?
A. Yes, I do.
Q. I apologize. You know, the -- there is some little splotch on this, but...
Have you used IEEE dictionary before, in your professional career?
A. I don't know that I've referred directly to it or not. Whether I have or not, I'm sure it's been part of either other documentation that I've reviewed or looked at or maybe have been referenced in other materials.
I certainly have no concerns about -- about this as a dictionary for use in the field.
Q. In the field, meaning in the field of electrical engineering?
A. That is correct.
Q. How about in the field of LED? Is that considered the -- part of the field?
A. Yes.
Q. Have you used IEEE dictionary before in

connection with your providing or opining on other patent cases?

A. I don't recall for sure particularly this specific reference.

Certainly, I've used IEEE references in providing opinions. I can't think of specific ones at the moment, but it is certainly a reference that -- that I would consider.

Q. You know, the title of this dictionary called Authoritative Dictionary of IEEE standard terms, do you consider the definition in this dictionary authoritative -- authoritative.

Sorry. I'm having trouble pronouncing that word.

MR. OCZEK: Objection. Form.

THE WITNESS: I'm not sure exactly how to -- to answer the question. As is always the case, we sometimes pick words that we think would bring attention to a publication.

I don't know what is actually intended by "authoritative," meaning IEEE doesn't have authority over -- or other groups in any specific sense.

I presume what's being meant here is this was intended by IEEE and the authors, anyway, at this time to be an important dictionary in the field.

BY MR. CHEN:

Q. Are there any other specialized dictionaries in the field that's other than, for example, the general purpose dictionaries you consult, where you provide opinion on definitions for, let's say, kind terms in patent cases?

A. There are many, you know. Many of them are subsets within IEEE. For example, I've referred often to, you know, specific IEEE publications in -- in electronics as well as in -- in optics and lighting.

We also refer to other organizations; for example, Society for Automotive Engineers is a -- is a reference we often use for application and -- automotive application.

There are additional societies for optics and for LEDs that are also referenced. There are also many very good authors that have combined and published both textbooks as well as general references that are ultimately considered good desktop references in the field.

I think these are all -- all important documents to be considered, certainly anytime providing opinions in -- in a case such as this, but also for general use by engineers in these fields.

Q. If I can turn your attention to -- I think it

would be Page 3 of Exhibit C, which is the IEEE dictionary. I can direct your attention to -- so the second column.

Do you see a dictionary entry "series circuit"

MADAM COURT REPORTER: Dictionary entry --

MR. CHEN: Series circuit, like, you know, electronic circuit.

MADAM COURT REPORTER: Thank you.

MR. CHEN: Quote/unquote, series circuit quote/unquote.

A. Yes, I do.

Q. If you want to take a minute, could you please just study that definition provided in the IEEE dictionary.

A. (Witness complies.)

Q. Let me know when you're done.

A. I am done.

Q. Do you agree this definition would provide the understanding to what is meant of the term "series"?

MR. OCZEK: Objection. Form.

THE WITNESS: Well, just to clarify -- and I think I've made this clear in my declaration as well -- one skilled in the art is very familiar with the term

"series," as well as the terms that are at hand in this case, you know, connected or coupled in series.

The definition that's written here for a series circuit is a viable definition, one that I even, myself, might use in an introductory circuits course, to really help those, perhaps, that are not yet skilled persons, according to our definition, to understand the new concept of series. And there are similar concepts, like parallel that we teach in an introductory circuits course; in which case, we would give a simple definition, a clear, simple definition that would help them understand this new concept. We would do this with ideal components, with a small number of components.

And as described here, having components that have the same current that passes through them, the device is completing a path.

You know, in an introductory circuits level, this is how we help people understand what a path is, how the components would be connected, and this early concept of series.

The reason, in that case, we would be so clear that, for example, the same current passes through them. There's a question, you know, in the simplest case, where these are ideal components and

there's a number of small components, in that case, same might indicate identical, you know, the same current. There is no other current flowing in those components.

That helps to, as I've taught them, to understand the early concept and to be able to apply current and voltage rules to directly solve the exact solution per currents and voltages in these circuits.

But to -- to your question as far as a skilled person, you know, this would be very, very well known. They would have known this for years, the basic idea of a series circuit as well as how this might be applied.

But it's not the end of the story. There's more to it.

You know, as I train students in more advanced courses or in short courses to industry, then I would help them understand, okay, circuits are more complex. There may be tens, hundreds, even thousands of components in a circuit.

We then look at more generalized use for the term "series," for example, to understand the elements and an ability to approximate and generalize the description and how we might use that term, "series," in a more generalized sense.

So I believe to answer your question, this definition, a skilled person would certainly look at it and say: Yeah, I get that; I know that; that's how it was taught to me in my freshman or sophomore year in college. But they would also recognize its application in a real scenario, such as in Claim 1 of the '577 Patent would go beyond this.

The definition listed here is sufficient, but it's not whole story.

BY MR. CHEN:

Q. Putting the patent aside, you would agree this would be a meaning generally understood by one of the skilled in the art of the term "series" or in series, putting the patent aside --

MR. OCZEK: Objection. Form.

BY MR. CHEN:

Q. -- the '577 Patent aside.

A. Well, as I mentioned, a skilled person, you know, one who has graduated with a degree in -- in -- you know, in the field who has some experience or some advanced knowledge in the field, they would read this definition and, yes, they would recognize this generally as a good description of a series circuit. And they would also recognize how to apply this definition in a practical sense in, you know, complex

circuits that have many components, and how to interpret this in a realistic way, meaning how would this really be applied in -- in describing a circuit in a meaningful way.

And when I say "meaningful" way, I mean in a way that would help others of ordinary skill in the art understand what they mean, understand how the circuit was intended to behave.

So, yes, I believe a skilled person would understand the writing, this definition, would see where this came from. I'm sure this was written by a team of skilled persons. And they would also understand how this is applied in a practical way beyond the elementary definitions that you would have in an early course.

Q. Thank you for that answer/clarification.

So what I'm putting in the chat room is what we've -- been previously marked as Zane Dec. Exhibit 7.

I have just uploaded it to the chat room. Please download it onto the computer, Dr. Zane, and please let me know once you've downloaded it.

A. I have it downloaded and open.

Q. It's a one-page document; right? It's a -- it's a just .

So if you can humor me for a second, let's,

you know, assign some value to the various components on this circuit.

I think if you look at the figure -- and you do have the document open in front of you; right?

A. That is correct, yes.

Q. So what is shown in this diagram became Point 1 and 4.

That's a depiction of a battery; right?

A. That is correct.

Q. And what is shown between Point 1 and 2 of this diagram, which is labeled R1, that's a resistant; right? Or represents a resistant; right?

A. That is correct.

Q. The same goes to R2, which is depicted in reading 2.2 and 3 in the square, and R3 between Point 3 and 4 in the diagram.

There's two additional resistors; correct?

A. That is correct.

Q. So, like I said, let's just assign a value -- sorry to ask you to do a bit of math, but hopefully that's easy for a person of your caliber.

Let's assign a value of 12 volts to the battery. If you need to take a pen, go ahead.

A. If it's okay, I'm just going to just write this down.

Q. Yes. Go ahead.

And let's assign a value of 4 ohm to R1, the same value for R2, and the same value for R3, so all resistors gets the same value.

A. Yes.

Q. So let's say this -- okay -- when it's closed, meaning the current flows less through it, can you tell me what would be the value of the current flows from .1 to .2?

A. Yes. Yes, I can. And following up on my previous answer, you know, this is a very good example of how the circuit length -- this might be taught in an introductory circuits course when first introducing the concept, for example, of series.

And so I appreciate the additional clarification example here. And the reason we do this with simple circuits like this, idealized components, is to teach exactly what you're asking me, the basic idea of how we apply the current and voltage laws that would allow exact solutions when you're first getting familiar with how to understand circuits.

And so in this case, we can solve the behavior of the circuit by looking at the loop, you know, constrained by R1 and R2 and R3. This would then tell you what the total resistance is in this

simplistic scenario, which is the sum of the four, four, and four.

So this makes 12 ohms. We have 12 ohms, if I'm doing the math right, applied essentially to our 12-volt battery.

Now, understanding that circuit and its behavior in this simplistic scenario, we can look at applying ohms' law to understand what would the current flow in that circuit be. And in this case, you know, 12 volts and, if I'm doing this right, 12 ohms, we would have 1 amp of current that would -- that would flow, assuming this configuration.

That current flows in -- in the way it's depicted here in this simplistic, ideal circuit. That current would flow in R1, as I believe you've asked me, from 1 to 2, 1 amp. And that same current would flow two to three and three to four, the way this circuit is drawn.

Q. Thank you. You anticipated my question, so I appreciate it.

So let me see. I will load, again to the chat room -- give me a second to do math. Okay. Sorry.

Let's just stay with Exhibit 6 -- 7 for a second. Can you do a little math which is slightly

more complex?

What would be the voltage between Point 1 and Point 2 Point 1 and 2? of this diagram, in that sort of a mathematical model we talked about where we assign a 12-volts value to the value rate and 4 ohm value for each and every resistors?

A. What you're asking is another good example of the type of analysis that we teach in a first-year, you know, freshman or sophomore level in college, the basic -- basic idea of how to solve a circuit and solve the math behind it.

So in this scenario, where we have these -- these idealized elements as drawn, it allows exact solutions. As I mentioned before, once you move beyond these early courses, you start looking at realistic systems and circuits that are far more complex, and we have to start making approximations or generalizations on how we describe them. In which case, we essentially do the exact same math. It's just not exact and gives us a pretty good idea of how the circuit works.

In this case, it's exact. We assume, based on the way this was drawn, these were idealized simple components. They're only connected in the way that is shown, and we can solve this fairly -- we solve it exact.

And so when students first learn current laws and voltage laws, they're able to do exactly what you just asked.

So as I stated before, by solving this circuit, we determined that we had, in this case, 1 amp flowing to these circuit -- through these elements. And what that then allows us to do is calculate, given the impedance for this case, the simple resistence of each element, what the voltages would be on each element.

And in this case, since they're all four ohms, they would each have 4 volts across them. And in this simplistic scenario, where there's one loop in the simplistic diagram, they would add to exactly the voltage that you see on the left-hand side, so we would 4, 8, 12 to get us to the 12 volts of the battery.

Q. So just to confirm, the voltage up from one to two is 4 volts. The voltage up from two to three is 4 volts, and the voltage up from three to four, that's 4 volts; right?

A. Yes. That's correct in this simplistic scenario, yes.

Q. I think you mentioned, you know, when your students -- let's just say it gets more advanced beyond

the simplistic circuits. You're still trying to do something as an approximation of the simplicity; right?

Do I understand your testimony correctly? Or maybe I missed, because your answer is pretty long. I tend to have a short memory of that.

A. I believe what you recall is correct.

So as students move to more advanced courses or -- also, I have taught many short courses in the industry, we look at far more complex circuits. But we may have a circuit, for example, that would be quite similar to the one that we have shown here, but it might have, you know, 20 or 30 components. But maybe the four components that are drawn here are dominant behaviors or dominant components in that circuit.

But there may be additional components. For example, we may be measuring the voltage between two and three with, you know, another resistor divider or an Optocoupler or additional, you know, circuit components.

R1 might be made up of multiple components. R3 might be a model of another component structure that has, for example, additional capacitance and additional, you know, resistance that goes to ground, you know, in a common mode part of the circuit.

You know, these are complications, but as

students get more advanced, they're able to deduce what's the generalized behavior of the circuit and what are the important, you know, salient, as we often call them, features.

And then we can zoom in and understand, okay, we can apply a lot of those same early principles to these more complex circuits, and most importantly, we can convey that message to others of skill of the art so that they understood they had don't have to, you know, reanalyze or understand what we did or why we did it. We can describe that behavior.

So in this case, for example, the circuit as we see here could be described as: Hey, we've got a salient feature with a battery and essentially three components which could be predominantly modeled as resistors or having resistance. And we can describe this, for example, as a series connected or series coupled circuit among these elements. And that wouldn't, you know, detract from the fact that there are other components or paths, for example, that might be part of the voltage monitoring of R2 or the other parasitic aspects I just mentioned.

It would help another circuit designer, another person of skill, read what I've stated and understand, oh, I get it, you know. R1, R2, R3 -- they

were in -- they're connected or coupled in series, and they -- they have that basic behavior that we all understand.

Now, it might not be exactly 1 amp following into every element, but the concept would be clear, and they would understand what I was doing and why from that description.

That's the type of expansion, what I meant by either approximations or aggregation or, you know, application to key salient features that a more skilled person becoming a person of skill in the art would understand.

Q. So just to close this up, so you're saying R1, R2 is connect in series to --

MADAM COURT REPORTER: Connecting series...

MR. CHEN: "Connect in series."

THE WITNESS: Yes. As I believe you've asked, summarizing what I have just stated, it would be my understanding that a skilled person looking at this simplistic diagram would -- would understand that R1 and R2 are connected in series and, similarly, understand, at least in the context it was portrayed in the '577 patent, that they are connected or even coupled in series.

And I guess summarizing what you've asked me

previously, you know, if there were a more advanced circuit that had additional elements that didn't detract from the primary function or salient feature of this series connection, you know, a skilled person would similarly describe those elements as being connected or coupled in series.

Q. And R2 and 3 is connecting series?

A. In the same ways that I've just described R1 and R2, with the covenants of simple and more complex circuits, yes.

Q. And that would have defeated IEEE definition we just went over?

MR. OCZEK: Objection. Form.

THE WITNESS: Generally speaking, I believe the answer is yes.

And -- and as I mentioned earlier, I've reviewed each of the Theoclear as well as the dictionary definitions, and our general concept as we've described here, would -- would apply. Our discussion, I should say, would apply to each of those -- each of those definitions, I believe. I know we're speaking specifically to the IEEE one.

The short answer is yes. First off, certainly with this simplistic circuit -- as I mentioned, this is where you start. This is how I

teach this in introductory electronics.

These are idealized components drawn simply as shown. It almost perfectly fits that definition that was stated in the IEEE that we just read previously. And as I mentioned more broadly, for more advanced circuit design, a skilled person would also understand how to apply that definition to this concept in a more complex circuit, but they would recognize -- for example, you know, the word "same" in that definition wouldn't necessarily mean absolutely identical currents are flowing in each resistor but, rather, their intention in describing this as connected or coupled in series would apply to that concept that there is current and you could call it the same current, you know, flowing among these devices, in this case these three resistors.

But in that more general sense, it doesn't have to be exactly identical. They read that word into the same just to be careful and be sure we're being clear.

BY MR. CHEN:

Q. Thank you very much for the clarification.

MR. CHEN: So, Jeremy, do you mind if we take a five-minute break? I think we've been going for about an hour.

MR. OCZEK: Yeah, that's fine with me.
MR. CHEN: Okay.
So we're going to put on mute, and turn down.
And, Dr. Zane, again, thank you so much. And we will be back in five.
THE WITNESS: Thank you.
(A short break was taken.)
BY MR. CHEN:
Q. So, Dr. Zane, thanks for coming back.
Just to confirm, you're ready; right? We can proceed?
A. That is correct.
Q. Thank you.
So I have now -- or I am uploading to the chat room in Zoom what is previously marked as Zane Declaration Exhibit 8.
So please confirm when you're able to see it and download it and open it on your computer, Dr. Zane.
MR. CHEN: As you're looking, Jeremy, I just want to doublecheck and confirm your team has been able to download and receiving these exhibits -- right? -- which we have been downloading for the last hour?
MR. OCZEK: That's correct.
MR. CHEN: And also just a, you know, I think a housekeeping matter, I think what I realized as I was

reviewing Dr. Zane's declaration -- there's Exhibit 8 to the Zane declaration. There's Exhibit C to the Zane declaration.

Looks like it skipped Exhibit B. I just confirmed we haven't missed anything. There's no Exhibit B to the Zane declaration.

MR. OCZEK: That's correct.

MR. CHEN: Okay. Thank you.

BY MR. CHEN:

Q. So, Dr. Zane, so just -- again, just to confirm, you have Zane Deck Exhibit B downloaded to your computer, opened in your computer?

A. That is correct.

Q. So, again, this is one of the -- another diagram you drew, again, just a few -- for a second. We'll just completed the exercise.

Again, here, there are circuit elements here, a battery, three resistors identified as R1, R2, and R3; correct?

A. That is correct.

Q. All right.

So let's assign the same value we have assigned for Exhibit 7 for these various elements. Specifically, let's assign 12 volts to the battery that's depicted in between one and eight and four ohm

as the resistant value for the -- for each and every resistors depicted here in Exhibit 8, which is meaning R1 equals 4 ohm, R2 equals 4 ohm, R3 equals 4 ohms.

Again, can you humor me? Can you explain to me: What would be the -- if it's a closed circuit, what would be the current flowing through from two to seven across this one or R1?

Feel free to mark it on the exhibit. Oh, sorry if you don't have a physical copy, but, you know, you can use a notepad and do that calculation.

A. So following up on our previous discussions, this is another good example of a very simple idealistic circuit to help early students understand how voltage and currents can be solved, in this case even exactly, as they're becoming familiar with circuits.

So in this case, as I believe you'd stated -- and correct me at any point if I've got this wrong -- we still have a 12-volt battery connected in one to eight, and then each of the resistors continue to have a value of 4 ohms. And in this case, the voltage across the resistor is easy to solve because it is the voltage of the battery.

So in this case, for example, you asked me a current flowing. When you say between 2 and 7, I

presume you mean specifically through the resistor R1.

Q. That's correct. Sorry. I don't mean to interrupt, but go ahead.

A. No. Thank you for the clarification.

So the current flowing through the resistor R1, in this case, again applying ohms' law, once we've already solved the voltage across it would tell us that we have the 12 volts divided by the 4 ohms. And if I'm doing the math right, that would give us 3 amps through that resistor R1.

Q. What about the current that goes through Resistor 2, R2?

MADAM COURT REPORTER: "What about the" -- I'm sorry. "What about the" --

THE WITNESS: -- "the current that goes through the second resistor, R2."

THE WITNESS: The resistor, R2 -- similar to our previous discussion but, in this case, now knowing the -- the voltage that is across R2, the current flowing in R2 would also be the same 3 amps.

Q. And what about the current flowing through the third resistor, R3?

A. For the -- for the same reasons, again, the current flowing through R3 would be the same 3 amps.

Q. So what would be the total current flowing

from 1 to 8?
A. The -- the total current --
Q. Let me put it a different way.
What would be the current if you take a measurement flowing between Point 1 and 2 of this diagram?
A. Yes. Thank you for the clarification, just so that we can get the polarity defined.
So the current flowing from one to two would be the sum of the currents flowing in the individual resistors. In this case, it would be the sum of each of those three amps. This would total to, if I'm doing the math right, 9 amps flowing in total from 1 to 2.
Q. And the current returning from .7 to 8, that is 9 amps as well?
Am I understanding that correct?
A. In this idealized circuit, that would be my understanding. But the circuit, as drawn, you know, has no additional elements, no parasitic elements, as we might call them, you know, in this more vast discussion that we mentioned.
So this is a very good example for -- for defining the basics of the circuit. In which case, the current flowing from 1 to 2, you know, assuming everything is perfectly ideal, would be absolutely

identical to the current flowing from 7 to 8, that same 9 amps.

Q. So how would you describe the relationship between R1 and R2? Do you call that a connecting series?

MR. OCZEK: Objection. Form.

THE WITNESS: So the way that we would describe combinations of circuits and elements, as I mentioned, can be more complicated, depending on the scope and the broader scale of that circuit. If this were, you know, a larger, more complex circuit, I might describe that behavior differently, depending on how things are connected and how they operate in terms of which terms I would use.

In this kind of elementary circuits discussion for a very simple circuit as drawn here, we would typically, you know, look at R1 and R2, in this case -- and the same goes for R3 -- and say that, you know, as they share the same voltage, that these would be, you know, acting essentially as circuit components. They're operating in parallel.

BY MR. CHEN:

Q. I just want to confirm.

They are not coupled in series as one skilled in the art would understand?

MR. OCZEK: Objection. Form.

THE WITNESS: Well, again, just to clarify, it really would depend on the broader circuit, but -- that these are contained in.

This may be a simplified nature of a different, you know, nature or combination of components that might very well be important to explain, for example, you know, the series loop that flows between R1 and R2. In this case, you know, there is a direct loop that contains R1 and R2 and, in some scenarios, may be important to describe as this series' behavior and connection.

But as the circuit is drawn, you know, the entire circuit is fed from the voltage source, you know, between INs sp? or Nodes 1 and 8. And, you know, these elements on the right are being fed from that source.

So at least -- you know, presuming I'm explaining this basic circuit and -- for example, an elementary circuits course, it would -- it would appear to me that the right way to explain and describe the connections would be that R1 and R2 and R3 are in parallel. And that combination you could either say is in parallel with the voltage source or in series. You know, in that case, it's just, you know, one element,

you know, in parallel with or in series with the other.

So to your question, you know, it depends on the context. But my presumed context here of describing elementary circuit, you know, with this voltage source and this configuration -- you know, I would typically explain R1 and R2 as being parallel because in this particular case, explaining that they're in series doesn't seem to provide any additional insight or proper understanding of how that circuit operates.EX PRENS?

BY MR. CHEN:

Q. Great.

Actually, I might have some slightly more complex for you.

So I'm uploading to the chat room again what's being -- I'm going to say marked as Zane Dec. Exhibit 9 as another diagram, as I promised.

Please confirm that you received it, you downloaded it.

MR. CHEN: Again, Counsel Jeremy, if you have trouble downloading it or reviewing it, just let us know.

MR. OCZEK: Okay. Just give me a moment. Okay. I've got it.

Dr. Zane?

THE WITNESS: Yes. I have it up, and I have received it.
BY MR. CHEN:
Q. You have it open in your computer too?
A. I have it open in my computer; that is correct.
Q. Thank you for that confirmation.
So, you know, let's just go through the same exercise.
Again, what's depicted in Exhibit 9 or Zane Deck Exhibit 9 is, you know, a diagram showing a -- circuit elements like a battery has three resistors, R1, R2, and R3 -- you know, Dr. Zane, if you can entertain us, that's -- to the same exercise, I will assign the same value to these elements, specifically the battery is assigned a term ch voltage, all the resistors Resistor 1, Resistor 2, Resistor 3. They're all 4 ohms each.
And with that setup, could you please do the math and explain to us if it's a closed circuit, what would be the current flowing from 2 to 5 through R2, the current flowing through R2 in this diagram? ?
A. Yes. So in this circuit, the -- again, with the kind of things ch that we mentioned before, in this idealistic nature, we're assuming that each of the

components are perfectly ideal, there are no stray paths, in which case we can again apply the voltage and current laws that an early student is learning and get, you know, what we presume to be an exact solution.

And so in this case, we would look at, you know, the total, you know, resistance being applied to the battery. In this case, that would be, you know, approximately -- or in this case exactly, 6 ohms. And so the current flowing from 1 to 2 would be 3 amps, if I'm doing the math right, where we had 12 volts and roughly 6 ohms. And then that current would then be shared among the elements that are depicted here as R2 and R3.

And, again, in this simplistic scenario, we're assuming these components are ideal and exactly the same. So half of that current, in this case 1.5 amps, if I'm doing the math right, would flow through R2.

Q. Okay.

Just to make sure I understand, sir, are you saying the current flowing through R1 is 3 amps?

A. The -- here's what I said. I don't argue if I've done the math wrong here. But yes, that is what I said.

The basic -- you know, the concept of what

I've presented here is what we have over on the right-hand side, R2 and R3, we've depicted as being 4 ohms each, which means, you know, their equivalent resistence would be roughly half of that, so 2 ohms as a single element.

If we were to replace R2 and R3 with a single equivalent resistor, if I'm doing the math right, it would be roughly 2 ohms. And then that is also related to RR1 as 4 ohms.

So it appears, if I'm doing the math right, that we have 4 ohms equivalent being applied to the battery 1 to 6. And if I remember, we had a 12-volt battery.

So, again, if I'm doing this right, 12 volts divided by 6 ohms should give us -- and I don't know if I -- did I say -- did I say it wrong? Did I say --

Q. No. I just want to make sure.

A. 12 divided by 6 should give us the 2 amps, and -- okay. You know, it sounds like I'm getting myself, you know, mixed up on the numbers, but the concept is exactly what we're describing. It's this is how you would explain, you know, the sequential steps here.

But, anyway, yes, to doing this live, you know, the end result is --

Q. No. I just want to make sure, you know, we all get it --

A. Make sure we get this right. 12 volts and 6 ohms would give us that 2 amps.

So just to clarify what I said before -- and I appreciate you giving me that chance. But yes, from Node 1 to 2, you would have that full current flowing, which would be, in this case, that -- the 2 amps.

And then as I said before, because we have two identical components, that current would split evenly between those two, as we would have the 1 amp in R2 and, of course, then 1 amp in R3.

Q. What would be the voltage drop between Node 1 and 2?

A. In this case, we would have, you know, roughly -- because of the differences in the numbers here, we would have roughly two-thirds of the voltage applied across R1 and roughly one-third of that voltage applied across the, you know, remaining two resistors.

So in this case, we would have roughly 8 volts, again if I'm doing the math right, of the 12 right across R1, which is what I believe is what you asked, between 1 and 2. And then the remaining 4 volts, the other third, would be applied roughly between the remaining terminals here.

Q. Thank you.

So you anticipated my question. I appreciate that.

So, sir, R2 and R3, these two elements -- 2R is still called in the art.

MADAM COURT REPORTER: I'm sorry. These --

MR. CHEN: R2 and R3, these two elements still in the art, would you consider them to be -- oh, wait. That one order? is still in the art would consider to R and the 2 to be connecting parallel?

MR. OCZEK: Objection. Form.

THE WITNESS: Again, we're speaking generally. And, you know, for a skilled person, how they use the term "series" and "parallel" would depend on the application of the circuit.

Given the application that we're indicating here, assuming, you know, no additional factors that would -- that are not drawn or not shown, then it would be my expectations that -- that R2 and R3 would share the same voltage by explaining that they're connected in parallel would be a good way of indicating how they're -- they're physically laid out.

A skilled person, in my expectation, then, you know, in this -- in this specific scenario would use the term "parallel" to explain how R2 and 3, for

example, are connected.

BY MR. CHEN:

Q. I believe you testified, you know, theoretically we can , in R2 and R3, sort of deem to be a single element of 2 ohm resistor.

So in that sort of theoretical scenario, how would be R1's connection with R2 and R3 combined? Would call that connection or coupled in series?

A. Yeah, good question.

MR. OCZEK: Objection. Form.

MADAM COURT REPORTER: Did you say "Objection: Form"?

MR. OCZEK: Yes. Yes, I did.

THE WITNESS: Yes. Good question to walk through here.

So as I stated, you know, R2 and R3 typically could be inserted parallel. As I mentioned before, they could also be considered in series with each other, but you would only say that if there were specific behavior happening that series between those two. For example, you know, a resonant behavior between those two.

But if they truly are, you know, two resistors, ideal resistors as drawn here, it would be common, when analyzing the circuit, you could consider

the two as a combined element, in this case a resistance with the numbers you gave me at half of the value. That new resistor would then be in a circuit together with R1.

And I believe you asked would we be considering them to be connected in series. And the short answer is yes. The equivalent element of those two resistors, R2 and 3, would be coupled to and connected in series with R1.

BY MR. CHEN:

Q. So just with respect to the specific diagram, Exhibit 9, in front of us -- so in terms of connecting parallel versus connecting series, how would you describe the relation between R1 and R2?

A. Yes, I appreciate the question as well as the sequence here, because I do think it really helps us.

This now gets into the detail of what are these elements and what are they representing, how are they being used in the circuit with regard to how a skilled person would describe that relation. But as we just described, the combination of R2 and R3 are unquestionably in series with R1, as we just stated.

Individually, it really depends on the operation or the behavior of the circuit or the reason we're even using the term. Typically, we, as a skilled

person, you know, getting outside of the basic introductory circuits discussion -- but as a skilled person, if we're looking to apply the term to a circuit, do we have a reason to do so? And, for example, as we get to the '577 patent, we're applying it specifically to interpret and understand the intent of the inventor in those claims.

In this case, it is quite possible, then, in a similar scenario that when we are describing R1 and R2, you could describe this as being connected or coupled in series to emphasize an aspect of importance of that circuit, just like the combined elements R2 and R3 are considered in series with R1. Either one of these two individually could be considered coupled or connected in series with R1. It would depend on the context, which a skilled person would immediately recognize and understand.

For example, if R3 were not, you know, some generalized scenario but in a real circuit, R2, for example, might be the load of a circuit. R3 might be the equivalent of a voltage sensor in a circuit. And R1 might be an important aspect of a -- of a supply, the supplying current, for example, to R2. In that case, I believe a skilled person wouldn't hesitate to explain that R1 and R2 are connected or coupled in

series.

Q. Sir, but, you know, we did provide you specific context; right?

Assigning 12 volts to the battery or assigning 4 ohm to R1, 4 ohm to R2, and 4 ohm to R3 in this particular context, you're still considering R2 is connecting series?

A. Well, again, it depends even the application. I know we have specific numbers, but why are we describing them -- you know, why is a skilled person having this consideration? What are they writing about? What are they describing about this circuit?

In the generalized sense, maybe the short answer here is yes, a skilled person could -- just like they described a combination of R2 and R3 as being connected and coupled in a series with R1, they could describe each of the two individually as being connected or coupled in series with R1.

Now, in saying that, the skilled person would also, you know, know and recognize what they mean by connected or coupled in series. What they mean is: Yes, they're coupled in a way that they share current from R1. They're fed from the current that is driven by R1. And that -- that provides me -- it provides intuitive understanding of the relation between these

components that R1 is supplying component to either R2 or R3, in this case equally, to -- to those two.

So explaining that they're connected in series or they're coupled in series is providing that same intuition that lumping the two together and saying they're connected in series would provide. But a skilled person, in say that, would also inherently know how to do the math behind it. So if there's more than one component, what -- what, for example, the exact currents going through each element would be.

But that is, I believe, a scenario where a skilled person would explain these connections to provide, you know, some intuitive meaning.

Q. Sir, I think we just -- I think you have been describing this diagram as simplistic, idealistic circuits -- correct? -- think the way I've been providing as a context for this circuit?

A. That is correct. You know, a good example is scenarios I'm sure I've taught in almost exactly these settings, you know, for an introductory course.

Q. Right.

And you also said IEEE dictionary definition would be something also you would probably lecture us too that -- in a introductory course to understand the general concept of what "series" means; correct?

MR. OCZEK: Objection. Form.
THE WITNESS: Just to clarify, I believe what I stated is that the definition that we read from the IEEE dictionary would be consistent with the types of, you know, things that I might have said or the textbook might have stated to help circuits -- you know, an early circuit student to understand a series -- series circuit.
BY MR. CHEN:
Q. Okay.
So if we apply the IEEE dictionary definition to this simplistic diagram, would R1/R2 considered to be conducting series?
MR. OCZEK: Objection.
Go ahead.
THE WITNESS: Yes. That is an interesting question.
The -- the application of the term as defined in the IEEE reference -- you know, the question here is -- I think -- I believe you asked: How would a skilled person, you know, apply that to the circuit, and would, for example, R1 and R2 meet that definition of -- of a series circuit, is -- I believe was the -- the element or the terms being defined in the IEEE reference.

So, you know, again, as I've stated before, a skilled person would -- would have a reason for applying the term. They would immediately understand and know the term. They would be using the term to convey some matter of intuition or some matter of application to other skilled persons to understand the behavior of the circuit. In which case, you know, you could -- you can almost take it two ways, depending on what is being explained and why.

But the definition, you know, essentially says that we have components, you know, for example, R1 and R2, and from the IEEE reference definition, these components are connected in such a way -- I'm sorry. I'm paraphrasing it. I don't remember the exact definition -- but they're connected in such a way that they have the exact current.

And so now the real question here is for a skilled person, how are they applying this in a practical -- you know, is it being applied in a practical scenario. In which case, how would they interpret the definition here of the same current?

There are certainly scenarios, as I just mentioned, where they would say R1 and R2 are coupled in series. And because what they're intending to convey is they're coupled in such a way that they do

share a current. They're -- in that case, they could -- they could recognize the same in that definition is meaning, you know, the current flowing in these two, you know, has a shared component. There is -- you know, all of the current, for example, in this case in R2 is coming from R1. There's a direct relationship in their currents.

BY MR. CHEN:

Q. Alternatively, you know, there could be a different take or view on that definition, which is partly where the concern I think comes in here.

If that definition is intending to mean the currents have been to be perfectly identical to be considered a series connection, then if that clarification were made, then a skilled person would look at this and say, well, if I'm applying that specific definition, the currents have to be identical which, of course, is not what the IEEE definition says. But if that were somehow conveyed to a skilled person, this is how you should apply it, then of course what we just discussed: The current in R1 and R2, they're not identical.

I hope I'm helping understand the clarification here between these two.

Q. So what is your view how to best describe the

between R1 and R2 within the context I've provided in this simplistic, idealistic circuit, where, you know, the value is being preassigned, 12-volts, 4 ohms, 4 ohms, 4 ohms, 4 ohms?

A. Well, as I stated before, without -- without context of what I'm explaining, who I'm explaining it to, or why I'm explaining it, it is -- I don't want to say a difficult question to answer, but it is a question where I would answer differently depending on the additional context.

And part of the challenge here is we don't have a term to explain each of the different scenarios here, because it would become quite complex anyway. We have different words for every -- every type of combination of circuits, it really wouldn't be helpful, so we stick with a simple nature here. We stick with series. We stick with parallel.

And so now, really, again, it depends on what I'm describing and why.

In the simplistic case of the circuit, if I'm explaining the connections, if I had no other, you know, purpose or meaning behind this circuit, it's what we've already described; that, you know, that R2 and R3 act together.

And in the scenario where we're really

talking about how energy or power is being supplied from the -- the battery to the circuit on the right and we're not describing anything else like -- you know, I mentioned residence between R2 and R3 or -- or other behaviors.

If what I'm really describing is a simplistic behavior of a battery supplying current to R1 and R2 and R3 and there is no context for what they are and why they're there, you know, it's difficult to say why I'm explaining it, but if I'm explaining it because I want to help an early student understand this circuit, then it would be everything that we've already described. R2 and R3, you know, would act in parallel. They can act together as an equivalent resistor, which is clearly, as we've stated previously, connected in series with R1.

If we want to stick with, kind of, the simplistic scenario, that's really where I would end because we don't have additional terms for explaining, for example, the -- in a single word, R1 and R2 in -- in -- in a broad -- in a generalized context in a more specific context or -- please go ahead.

Q. Thank you, Doctor.

I don't mean to interrupt, but I don't want to keep you here too long, and I think it's about

lunch.

Still, I think -- I think we promised Zane Exhibit No. 5, which I am going to load -- or upload to the chat room of the Zoom meeting is what we have been previously marked as Zane Dec. Exhibit 5.

And, you know, Jeremy and Dr. Zane, if I can confirm that you received it, downloaded it, able to open from your computer, I would appreciate it.

MR. OCZEK: I was able to download it.

BY MR. CHEN:

Q. Okay.

Dr. Zane, can you confirm?

A. Yes. I have downloaded it. I have it open, and it shows Exhibit 17 on the front page.

Q. Yeah, just so that, you know, I got that to you.

This is the copy that signifies counsel as filed with the Court, so that has an exhibit cover page, just for the record. But we have premarked it as Zane Declaration Exhibit 5, just to avoid any confusions.

So, Dr. Zane, can I also bother you to -- I think you mentioned you have a hard copy of your declaration.

Can I also bother you to, you know, open or

have reviewed -- open that document as well, take a look at that. Put that document next to you as well, which, you know, I think we have previously marked as Zane Deposition Exhibit 4.

A. Yes, I have it in front of me.

Q. Okay.

So I have two exhibits, which, you know, one of them -- it would be the -- well, at that time.

So the Zane Dec. Exhibit 5, do you recognize this document, the one that's uploaded into the chat room? You downloaded it opening your computer.

A. Yes, I do.

Q. So this is the Webster New World College Dictionary Fourth Edition; correct?

A. That is correct.

Q. And you relied on -- or you referenced this particular exhibit in your declaration; is that correct? Do you recall?

A. Yes, that is correct. I referenced this definition in my declaration.

Q. Okay.

So if I can direct your attention to -- it's tough to say, maybe Page 4. In this particular exhibit, Zane Declaration Exhibit 5, which is the dictionary -- or dictionary of Webster's New World

College Dictionary.

If I can direct your attention to the dictionary entry for the word "series," and I believe you have identified in your declaration -- I'm just going to read that -- Paragraph 34 of your declaration of, quote (as read):

"I understand that Signify relies on the dictionary definition of," internal quotation, "series," end quote, "from Webster's New World College Dictionary," comma, "which provides the following definition: 'The arrangement of devices in a circuit such that current flows sequentially through a series component,'' period, end of internal quote.

"In my opinion, this is an accurate definition of," quote, "series," unquote, as used in the term, quote, "in series," unquote, "and is consistent with the way that the term is used in the '577 Patent," end of quote.

Do I read that statement from your declaration correctly, Dr. Zane?

A. Yes. I believe you have.

Q. So if we were to -- again, just reviewing the actual definition in that dictionary, it says -- again, I'm just going to again read and quote to it -- No. 5, ELEC, comma, an arrangement of devices in a circuit,

comma, in which the current flows sequentially through a series of components used brief -- chiefly in the phrase "in series," comma, CF, period, pay Leo , all in capitals, open parentheses, since seven, end of parentheses -- end of quote.

Do I read that definition from the dictionary correctly?

A. Yes, you do.

Q. Okay.

Do you notice -- I mean, I noticed that the dictionary said in which the E-current flows sequentially. And in your declaration, I think you quoted in the series that current flows sequentially -- I just want to make sure that's just maybe a typo on your part, because not exactly the same.

A. Yes, that is correct. Unless I've missed something else here, it certainly wasn't intentional. So any difference here would simply be a typo on my part.

Q. Thank you for confirming that.

So just on the dictionary, on the term, so there are -- if I can direct your attention to the dictionary definition one more time, there are other subentries here of definitions for Series 1, 2, 3, 4, you know, 6 and 7.

I just want to confirm that you're not relying on these other definitions provided for the term "series" to interpret or construe the term "series" as used in the term "in series" from the '577 Patent; correct?

A. Generally speaking, I believe that that is correct. But -- but also just to clarify, I'm certainly familiar with each of these definitions, both the dictionary in IEEE and I believe there may be one or two others that were -- that were put forward between the two parties.

But just to clarify, I believe you said you relied on -- the short answer is yes, in the sense that I'm familiar with each of these. I've reviewed each of these.

But just to re-clarify, you know, my opinion was that plain and ordinary meaning is truly the right approach here; that it was my opinion that plain and ordinary meaning is the appropriate construction for those terms that we've mentioned, you know, coupled and connected in series.

So just to clarify, I -- I referenced the statement. I made the statement that you just read with regard to whether I felt this was consistent with the way the term is used. But I haven't proposed that

any of these terms be inserted into, you know, construction of that term.

I do believe, for all the reasons I mentioned in our discussion today, that the best approach is plain and ordinary meaning, as these are very well-known terms for the skilled person. And I think there is risk in inserting additional language, frankly, from any of these definitions that might have a skilled person, you know, refine or rethink their understanding of how to practically apply these terms to find the intent of the inventor in the '577 Patent.

Q. Thank you.

Dr. Zane, can I bother you to maybe put all the documents aside and pull back I think what we previously marked as Zane Declaration -- or Zane Deposition Exhibit No. 4, which is a copy of '577 Patent.

A. Yes, I have that.

Q. Again, I know this was loaded to the chat room at the very beginning of this deposition. I want to confirm with Jeremy, counsel for Signify and Dr. Zane, that you have a copy of that -- a soft copy I uploaded to the chat room.

MR. OCZEK: Confirmed.

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BY MR. CHEN:

Q. So you've -- you know, again, Dr. Zane, if you wouldn't mind just, you know, putting that document in front of you, because the remaining questions, because they focus on that particular exhibit.

So, Dr. Zane, I think -- you're familiar with a term "AC," alternative current; correct?

A. That is correct.

Q. What is it?

A. So alternating current can be used, you know, to mean a variety of things, but the -- the term generally, you know, in the strictest sense simply means that current alternates between polarities, is the most common, you know, use of the term.

Q. So that means in two nodes sometimes goes one way; sometimes goes the other way -- is that correct? -- in the circuit diagram?

MADAM COURT REPORTER: I'm sorry?

MR. CHEN: In a circuit diagram, alternating current -- let's say I have two nodes in a circuit diagram. Alternating current flows through those two nodes, alternating because sometimes it will go one way; sometimes it will go the opposite way; correct?

MR. OCZEK: Objection. Form.

THE WITNESS: In an alternating current

system, meaning if there's alternating current flowing within a system between nodes, what you've stated is a situation that is true, typically. That -- that would mean that current could flow both positive and negative. That's what I meant by saying "changing polarities." That would typically also be recognized as meaning going in one direction and also going in, you know -- in another time in another direction.

I believe that's what you've asked. I believe that's the answer to your question. But just in case I misunderstood, let me also state: Because current flows in one direction and then at another time in another direction, that doesn't necessarily mean it's referred to alternating current. For example, we could have, you know, a bidirectional system with, you know, what we call direct currents or DC currents, which might at one time flow in one direction and another time flow in another direction. We wouldn't typically call that an AC or alternating current, but -- I'm not sure if we were differentiating, but the concept that you described is true for an alternating current in a -- in a wire.

BY MR. CHEN:

Q. And what is a direct current?

A. Well, again, we're speaking in abstract,

which -- which we need to be careful how these abstract terms are being applied and used.

In the field of electronics and LEDs and drivers and even related fields, we need to be careful. These terms are used to mean a variety of things. Oftentimes, simply spoken, when we say DC, what we mean it is a voltage that, you know, -- a system that's operating, for example, from a battery or from a relatively constant voltage source.

Oftentimes when we talk about AC, although it says "alternating current," in many cases what we're really talking about is -- is a, you know -- for example, the electric utility, the grid, when you plug into a typical outlet in a home, you are plugging into alternating current or an AC, but it's typically really describing the AC voltage? But if you apply a resistive load, like a typical lamp, then you would get alternating current through that load.

So your question of what is DC, what is AC, depending on the application they mean, you know, a variety of things. But a skilled person certainly understands how it's being applied.

Again, typically speaking, if it's AC, we're often talking about a circuit where there are either AC utility grid inputs and then currents and voltages in

the system, or there are alternating, you know, periodic currents flowing in a system. These are all examples of AC.

But a DC system, you know, might, for example, be a battery supply to a DC load. But that doesn't mean that at least in the way a skilled person would typically use that term, that current has to always flow in one direction in a DC system. You know, a battery -- a battery is a good example. You might charge a battery at one time and discharge a battery at another time all with DC voltages. It's unlikely that a skilled person would call that an AC system.

Q. Okay. Maybe we'll get to some specifics here.

If I can get you to direct your attention to Column 3, Line 48.

Do you see that's describing Figure 2, somewhere in the middle of that line that's beginning of sentence says Figure 2 shows an embodiment wherein a DC voltage source, comma, supplying a substantially constant voltage?

A. Yes.

Q. Do you see that?

And that gets back to Figure 2; right? And I believe connected to input terminals -- that's voltage

applied to the 30a and 30b that's depicted in Figure 2 of the '577 Patent; correct?

A. That is correct.

Q. Can you just explain what terminal -- a terminal is?

A. Terminals can be used -- you know, the word "terminal" can be used in a variety of ways, meaning, you know, at the very least, it typically means that a connection point where elements could maybe connect it.

Here, in this context, you know, the inventor is explaining that the -- a voltage, in this case a DC voltage source, can be connected to the circuit as shown in Figure 2, and it's describing these nodes, 30a and 30b, meaning these connection points, these nodes. Variety of terms here would be typical and expected.

In this case, the inventor is describing that as input terminals. I'm not sure that anything in particular was intended by that other than this is where a DC supply would be connected, but the DC supply is not shown specifically in Figure 2. But that is where it would be connected, is at those points, 30a and 30b.

Q. So I would direct your attention to Figure 2, have you, you know, look at Figure 2 of the '577 Patent. There is, like, an element mark at 32a.

Do you see that?
A. Yes, I do.
Q. There's also an elemented mark at 32b.
Do you see that, too?
A. Yes, I see this as well.
Q. So Figure 2 shows -- basically, these are 32 and 32b.
These are two switches connected to the input terminals here -- correct? -- input to Terminal 30a and 30b, respectively?
A. Yes. I believe that is correct.
Q. Just for clarity of record, 32a, which is the switch, is connected to 30a, which is the input terminal; correct?
A. At one of its connection points, that is correct.
Q. And 32b, which is another switch, is connected to 30b, as in "boy," as input -- I think what the patent describes as "input terminal"; correct?
A. Yes. In Figure 2, I believe that is correct.
Q. So these are switches, 30a and 30 -- 32 and 30b. So let's say in operation, 32a become a closed switch, which I understand -- you know, engineering understanding, its an ohm status, and 30b is open, which I understand, again, to engineers is off.

Can you explain -- well, first of all, let me just stop.

When I say 30b is closed and on this thing it's ohm, is that -- am I understanding that correctly, or am I using that term correctly?

A. Generally speaking --

Q. Go ahead. Sorry. Uh-huh.

A. Generally speaking, if I understand you right, you know, these terms are being used correctly. I don't know for sure the context or -- or where else we're headed with this discussion.

Similar to everything else that we've described, you know, there's a simplified discussion, and there's a more exact description. But in a simplified discussion, we would typically discuss this circuit, which I believe the patent also acknowledges as well known as what we call a bridge circuit or an H-bridge or a half bridge.

And, you know, when we're describing the operation of that circuit, we -- we often use simplistic terminology for the behavior of these -- these transistors, which, of course, themselves are quite complex in their behavior, but the way they're used in this circuit typically would be described as essentially idealized switches, at least in one way

that we would describe the circuit.

So it is helpful, in some scenarios, to describe those as essentially idealized switches in using the terminology of "on" and "off," essentially, like a short-circuit, when it's on in an open circuit or when it's off.

You know, that's not reality. You know, that's not really how the circuit behaves, but that gives us a pretty good understanding.

Q. Let's use that terminology, because that helps us to understand and get to the next question.

So what is the current pass from the input terminal 30a or 30b when switch 30a is on and switch 30b is off? How does the current flow?

MR. OCZEK: Sorry. I think you said the switches were 30a and 30b. I think -- did you mean 32a --

MR. CHEN: I meant 32a and 32b. Sorry. Thanks for the clarification.

Let me strike that. I'll reask the question.

BY MR. CHEN:

Q. So, Dr. Zane, can you explain the current pass from these two terminals, 30a and 30b when switch 32a is on or closed and 32b is open or off?

A. And you were looking for the path of

current --

Q. Correct.

A. -- from 30a to 30b?

Q. Well, how does the current flow?

Let's just say 32a is closed or on so that b is off. And, obviously, you have -- I think we just established a DC voltage source supplied to 30a and 30b at that point.

A. Yeah. I get it. Okay?

So in this scenario, you know, first, I'll just describe the path where current flows. You know, to our previous discussion, that current may be positive or negative, and so it may be moving in one direction or the other at any point in time, you know, as indicated in Figure 3B for the -- the current, what they're labeling as IS.

But neglecting that detail, I think to answer the basic question you're asking, let's not worry about whether the current is flowing right or left; let's just worry about, you know, which path does the current flow in.

And so in this case, you know, looking at Figure 2 -- and like we -- as we described previously, Figure 2 is an equivalent circuit diagram, much like this on/off discussion to help us -- is to help us

understand the -- the function and the behavior of this circuit so that we can properly design it and also understand its benefits.

And so what we're looking at in Figure 2 is an equivalent circuit diagram of the very real and important behavior of this -- of this circuit broken into elements as are drawn.

And so what I will describe is the way that current flows in the equivalent circuit, because that is how we, as skilled persons, you know, understand the behavior that defines the behavior of the circuit.

So in the circuit as the inventor has purposely drawn in Figure 2, using an equivalent circuit diagram, when switch 32a is in the "on" -- is operating as a switch that is on, then current path, again positive or negative, would flow from 30a, that input terminal of the DC supply, through the switch, one way or the other, 32a, to the capacitor which is defined as the Resident Capacitor 6. And then it flows over in this equivalent circuit model, so we understand its behavior, through the Inductor Ls, and then a portion of that current flows through the main or magnetizing inductance Ls of M. That is the resonance behavior that is described later in the patent, showing a resonant characteristic of the series connection of

Capacitor 6 Ls and Lm. But also a portion of that current flows to the right of Lm through the idealized behavior of winding 8a, and that current excites, in this idealized model of this transformer, a response and ultimately provides the current to the secondary side, to the Diodes 12 and 14, the Output Inductor 18, and the LED 22, and any other circuitry attached to that side.

So on the primary side, back to, kind of, finishing that path, we just went through 32a. We went through the Capacitor 6 and Ls, and then we have the -- the two paths in this equivalent circuit model to understand the circuit behavior through Lm and 8a. Those two sum back together again in this equivalent circuit model, neglecting anything that isn't shown back through this node, 36a, which comes back to 30b.

That path -- and, again, it's -- it's -- that particular current is alternating in the way it's described in the patent. So it would be positive or negative, but it would flow in that path.

Q. Can you explain the concept of the resonant capacitor in series with an inductor?

A. Yes, I can. And so what we're -- thank you.

So what we're discussing, just to put it in context -- for example, you know, the patent in a few

places describes the capacitor. In fact, I think it always describes Capacitor 6 as being a resonant capacitor, and it mentions its connections in a couple of places.

But specific to what you've asked, this resonant characteristic is described more clearly in Column 4 of the patent. And so looking at Column 4 at the -- at -- discussion here is with regard to the waveforms, and Figure 3B, looking around Line 7. And a little bit later in that paragraph, around Line 10, it's described that -- referring to the current -- the current alternates in polarity due to the resonant characteristics of the series connection of the resonant Capacitor 6 and the inductances Ls and Lm of the primary winding 8a.

And so referring back to Figure 2, the elements, of course, that we're talking about here are six, the resonant Capacitor 6, and the inductors Ls and Lm as drawn because, again, these are important physical phenomena to understand the operation of the circuit.

The capacitor is a capacitor. Calling it a resonant capacitor means we have a certain intent, you know, a certain purpose for that capacitor. The capacitor alone has no resonance, per se. The reason

that we consider this a resonant capacitor is its interaction and behavior with -- in this case, this was just described Ls and Lm.

And so in this case -- and this is a good example of what we were describing previously. This equivalent circuit model which is helping us understand the behavior of the circuit -- it's a complex circuit. It's a complex physical structure, for example, the transformer. There are many elements that can have impact.

But a very important behavior which is what is providing the serial voltage switching that I believe we quoted earlier and the benefit here of a resonant characteristic with that Capacitor 6 is that there is a series connection of Capacitor 6, Inductor Ls, and Inductor Lm.

And based on that description, as well as just understanding the whole purpose here of what's been described by the inventor, the skilled person would immediately recognize what's being described; that in this series connection, these elements are intended to resonate, meaning their values are selected -- and I believe there's another section we quoted that explains Ls and Lm are selected to accomplish this.

These elements are selected so that they have a -- a resonance, in this case, near the operating frequency which is the interval that we switch those switches back and forth at; but the entire circuit is designed so that these three elements accomplish what we describe as a resonant characteristic. That depends on the selection of the values and the frequency, as we call it, that we drive this circuit at.

So it's important -- it's an important characteristic that's being described that provides one of the significant benefits of the circuit.

Q. Thank you for the answer.

So I think you mentioned that Ls, L -- and Lm, the values are selected.

How are they selected? Like a physical -- I remember -- you recall you testified early Ls is like, you know, the primary winding. Physically, it's -- its physical embodiment would be some sort of coil; right?

So how do we select Ls and m?

Do we just pick a different coil with maybe different lens, different thickness, or different strengths?

MR. OCZEK: Objection. Form.

THE WITNESS: As I understand the question, the -- as you mentioned, we refer to where the patent

explains that Ls and Lm from Column 3 can be selected together with the resonant Capacitor 6 to accomplish this -- what is presumed to accomplish this resonant characteristic.

The patent also indicates that these elements could be part of a physical structure, the transformer could be integrated into that physical structure.

I believe you're asking how do you -- how do you realize such a structure to have these elements realized in the way that's described. And this is a common condition. This is something that the skilled person is very familiar with the need for the connection of these elements to accomplish the resonance and the possibility of achieving those elements through the design of a physical structure like a transformer.

The way that the skilled person would know to -- to implement such a solution is to go through perhaps, for example, careful modeling of the structure itself, meaning modeling that would look, for example, at magnetic fields and how those magnetic fields interact with the winding itself and through, then, the design of the shape of that winding relative to those magnetic fields, and now it may be a combination of the shape and structure that is selected of the winding

relative to, for example, the ferrite core that might be used, as well as the number of turns. What I mean by that is the number of times you turn a wire, you know, around, for example, the bobbin I mentioned previously and then even the size and type of wire would have impacts.

Even the location of these coils relative to other elements in that structure are how a skilled person would already know to tune that magnetic structure to achieve Ls and Lm.

But what -- you apologize this is going long, but quickly the skilled person.

BY MR. CHEN:

Q. No. I'm learning. Go ahead.

A. The skilled person would also recognize that the elements themselves could also be realized as individual separate components. For example, sometimes it may be difficult to achieve the actual Ls or Lm value that you desired within a certain size constraint or certain loss constraint or certain cost constraint that have transformer, in which case either/or both of those elements could be realized using a very similar but additional structure that would be placed right next to the transformer and it would be drawn in the same exact way shown in Figure 2 and accomplish the

same purpose in Figure 2. So those are the ways that a skilled person would know how to implement Ls and Lm as shown here in the patent.

Q. Okay. So is it fair to say that that the resonant capacitor number series with inductor select a path of resonant frequency?

A. I apologize, I might not have full heard the question, if you don't mind repeating.

MR. CHEN: So, Michelle, do you mind just read out the question I just asked.

(Record read.)

MR. CHEN: Yeah, let's strike that because let's make sure I get the question right.

BY MR. CHEN:

Q. Dr. Zane, let me strike that and ask it one more time.

Is it fair to say that the resonant capacitor in series with inductor selectively passes a resonant frequency?

A. Once again, I might not be entirely clear on the way that those terms are being used together. Something sounds just a little bit off to me. But maybe -- if I don't mind -- if you don't mind, if I can rephrase and we see if we're answering the same thing?

Q. Go ahead.

A. So I believe -- you know, rephrasing, what I understand is that capacitor 6 and inductor Ls and inductor Lm are described as connected in series, and they are designed so that in that connection, they accomplish resonance at the operating frequency or they exhibit a resonant characteristic giving the operating frequency of the system or the circuit.

Q. So the word "resonant," what does it mean?

A. Resonate, you know, like any of these terms, once we get difficulty of defining it, depends on its application in the field it's used in and where it is applied, which is, again, part of the challenge of adding definition to a term that's well understood. In the context of an electrical circuit, in particular in this context of a capacitor and an inductor, what we mean by resonance is that they're -- they're operating in such a way that they -- they -- they exhibit either a very high or very low impedance of a particular frequency in this case the resonant frequency. What that does within a circuit is that it means that it naturally creates this resonant behavior, meaning it allows energy to transfer back and forth between those two elements.

And in that section that we quoted earlier in Column 4, that is what the inventor's describing. It's

inventions that even though we have a DC power supply and we're -- we're supplying current into the system, we he said up with an alternating current or an AC behavior in the system because we have this energy moving back and forth between these elements, or, in other words, resinating between these elements.

Q. Than answer or your explanation of what resonant means, can you contrast that with the effect of the resonant capacitor in parallel with the inductor?

A. The concept of resonance applies in the context here of what we call reactive elements but inductors and compositors, the idea of resonance in the way I've described it would apply to any configuration where we have a combination of conduct ors and compositors operating relative to their values, their impedances that excites the circuit resonance. And so it really isn't dependent on whether we're talking about them being in parallel or in series.

Now, there are specific ways that we use those terms and that terminology to describe a type of resonance. And -- and oftentimes that also helps understand the type of resonant circuit that's being realized.

So if we have a capacitor and an inductor

that have been, you know, excited in some way, meaning energy has been supplied into them, now if they're the only two elements, then the only possible connection if there's going to be any current flowing them is -- would be on each element that would typically be the sort of parallel connection, but, of course, it's also a series connection because of this current that's flowing in that same -- being shared among those elements.

So what you're asking gets into, you know, more complex nature of describing, for example, in the context of resonant converters, we may describe types of resonance that help us. For example, have certain voltage transformations in a circuit and also certain protections. And so these combinations end up giving us what we might call a series circuit or a parallel resonant circuit or resonant circuit in the abstract it's hard to say how -- I suppose it's hard to be abstract if your question very directly, but the quote I have used to describe resonance is any time we have a capacitor and conductor connected in such a way that they can pass current between them or across them -- I should just say between them -- so that they can alternate energy between the two.

Q. Dr. Zane, Figure 2, what's your understanding

with respect to whether the resonant capacitor, which is No. 6 and which is RS Lm design to have low or high impedance?

A. Well, there isn't a simple answer to that. The -- the -- the response here is that as specifically stated by the -- by the patent inventor, these elements are designed to operate a resonant characteristic in their series connection. That resonant characteristic means that they -- they will be operating that such a way that they -- that they will alternate energy in the way that I've described.

Now, odds are what's really meant here is the circuit may operate at a frequency not at the exact resonance of the circuit, at least not without additional elements in loading to be applied here. So the impedance of the combination, again, also depends on where we're looking at that impedance. If we're talking about the impedance as we might call it seen by the power supply, you know, for example, in FIG. 1, the equivalent of those switches from Figure 2 and the DC supply are shown in FIG. 1 as a square way generator that's connecting the node 4a and 4b, in this scenario, this resonant characteristic of capacitor 6, inductor Ls, and inductor Lm are in combination in series as we have described would have antibeads -- difficult to say

whether you want to call that low or high -- but in that resonant characteristic, generally speaking, the closer we get to the resonance the lower it may become, the two may cancel each other. But the concept is still quite clear. We're looking for a resonant behavior that allows alternating of the energy, which means alternating of the current. In FIG. 1, by designing those components to be the right value so that we get appropriate current flowing for those notes 4a and 4b as shown in FIG. 3. What we get, then, from that resonant characteristic and behavior is a voltage that develops you know an AC voltage that develops across Lm. You know that voltage that develops on Lm describes a current that becomes a voltage that's applied to the secondary as it's described later in the patent or earlier in the patentor that voltage is applied to 18 to apply the substantially constant current.

The reason I'm going through that discussion is just to clarify what is the impedance of that circuit. It depends where we are looking at it from.

We can also be looking at the second side into -- into the primary side of that winding, in which case you're looking into Lm and Ls and 6 from -- from that portion on the right hand. That helps you

understand and the relative nature and behavior of the circuit. This applies the -- the current ultimate LED on the right-hand side. But all of that could be largely neglected as described in the patent if we just design that series connection with the resonance on the primary side to work properly and to work properly and to generate the voltage that we want on that transformer from Lm. That's the series connection and the resonance of 6 Ls and Lm that the inventor is describing.

Q. Okay.

MR. CHEN: I think -- why don't we take a five-minute break, and I promise we will wrap this up quickly. Again, thanks so much for your patience.

(A short break was taken.)

MR. CHEN: Jeremy, we have no more questions for Dr. Zane at this moment. I will pass the witnesser.

MR. OCZEK: No questions for the witness.

MADAM COURT REPORTER: Would you like a copy of the transcript?

MR. CHEN: Yes, we would like to have a rough and, I guess, a regular.

If we can get them three days by rough?

MADAM COURT REPORTER: I can do three days.

MR. OCZEK: Yeah, we'll take the same, please.

MADAM COURT REPORTER: So by Wednesday is fine?

MR. CHEN: That's fine.

MR. OCZEK: That's fine.

MR. CHEN: Well, if you can do the rough by Monday, that would be better.

MADAM COURT REPORTER: By Monday? Okay. I can do that.

(ROUGH DRAFT PURPOSES ONLY.)